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*Rodent migration in New Orleans—Date of rodent capture, time since release, and distance from place of liberation—Continued.*

SERIES B.

Date of capture.	Duration of travel.	Number captured.	Distance traveled (air line).
Apr. 8.....	1 day.....	5	4 rats 1 block. 1 rat 2 blocks.
Apr. 9.....	2 days.....	6	4 rats 1 block. 2 rats 2 blocks.
Apr. 10.....	3 days.....	9	6 rats 1 block. 2 rats 2 blocks. 1 rat $1\frac{1}{2}$ miles.
Apr. 9.....	2 days.....	2	1 rat 1 block. 1 rat 2 blocks.
Apr. 12.....	5 days.....	3	1 rat 2 blocks. 2 rats 3 blocks.
Apr. 14.....	7 days.....	6	3 rats 1 block. 2 rats 2 blocks. 1 rat $1\frac{1}{2}$ miles.
Apr. 15.....	8 days.....	4	3 rats 2 blocks. 1 rat 1 block.
Apr. 16.....	9 days.....	3	2 rats 1 block. 1 rat 2 blocks.
Apr. 17.....	10 days.....	2	1 rat $1\frac{1}{2}$ miles. 1 rat 1 block.
Apr. 19.....	12 days.....	3	1 rat 2 blocks. 1 rat 1 block. 1 rat $1\frac{1}{2}$ miles.
Apr. 20.....	13 days.....	3	2 rats 1 block. 1 rat 3 blocks.
Apr. 21.....	14 days.....	1	1 rat 1 block.
Apr. 22.....	15 days.....	3	1 rat $\frac{1}{2}$ mile. 1 rat $1\frac{1}{2}$ miles. 1 rat 2 blocks.
Apr. 23.....	16 days.....	3	1 rat 2 blocks. 2 rats 1 block.
Apr. 24.....	17 days.....	2	2 rats 1 block.
Apr. 28.....	21 days.....	3	1 rat $1\frac{1}{2}$ miles. 1 rat 1 mile. 1 rat 1 block.
Apr. 29.....	22 days.....	1	1 rat 1 block.
May 3.....	26 days.....	1	1 rat $1\frac{1}{2}$ miles.

Acknowledgment is made to the entire service force engaged in plague eradication in New Orleans for their very hearty cooperation in carrying out these experiments.

## TRACHOMA.

### ITS PREVALENCE IN THE SCHOOLS OF TUSCALOOSA, ALA.

By R. A. HERRING, Passed Assistant Surgeon, United States Public Health Service.

The discovery of trachoma among the school children of the city of Tuscaloosa has recently brought this disease into prominence in that vicinity. The situation necessarily demanded prompt attention, but before systematic measures directed toward control and eradication were instituted it was deemed advisable that the situation be carefully examined by some one thoroughly familiar with the clinical manifestations of trachoma and having a practical knowledge of the public-health problems presented by this disease. To this end, under instructions from the Surgeon General United States Public Health Service, and after conference with the State health officer of

Alabama, and in cooperation with the health officer of the city of Tuscaloosa and Tuscaloosa County, an examination of the entire public school enrollment was begun on March 22, 1915.

Tuscaloosa, at the present time, has an estimated population of 12,000 and a school enrollment of about 1,250. During the survey, 1,122 pupils of the city public schools were examined for eye disease, and, in addition, 240 students of the State university and 900 inmates of the Alabama State Hospital for the Insane, both institutions located at Tuscaloosa. The points in connection with these latter examinations will be discussed later. Four hundred and ninety-seven public-school children outside of the city of Tuscaloosa, but within that county, were examined, but as a majority of these rural schools have but a five months' school year, most of the schools had just closed when the survey was begun. This is to be regretted, as it would be highly desirable to determine whether the disease exists scattered over the county to the same extent as within the city of Tuscaloosa. Conditions in the relatively small number of rural schools visited would indicate that it may be more prevalent in the rural districts than in Tuscaloosa.

Careful inquiry elicited the fact that the infection present in the schools has been of relatively recent introduction. The predominating type of case clinically, together with the absence of severe and chronic cases, seems to bear out this supposition, at least among the class of population examined. Authentic cases of trachoma were observed among school children as early as two years ago. These, however, were too few in number to cause excitement at that time, and it has only been within the present school year that cases of trachoma have been seen with such frequency as to cause alarm.

#### Schools Visited.

	Examined.	Positive.	Suspicious.	Per cent positive.	Per cent suspicious.
<b>Tuscaloosa:</b>					
Tuscaloosa High School.....	200	5	6	2.5	3
Stafford.....	306	6	17	1.9	5.5
West End.....	178	9	10	5	5.5
Jemison.....	139	7	6	5.7	4.3
Chapel.....	55	2	5	3.6	9
Negro public.....	244	3	13	1.2	5.3
	1,122	32	57	2.8	5.1
<b>Rural:</b>					
Northport.....	156	10	13	6.4	8.3
Northport (negro).....	65	2	5	3	7.6
Holt.....	106	4	5	3.7	4.7
Brookwood.....	93	5	2	5.3	2
Searles.....	66	2	5	3	7.5
Searles (negro).....	11	3	6	27.2	0
	497	26	30	5.2	6
<b>Total.....</b>	1,619	58	87	3.5	5.4
University of Alabama.....	240	1			
Alabama Insane Hospital.....	900	6			

### Diagnosis and Type of Disease.

The examination of the school children of Tuscaloosa presented the usual conditions found among school children when examined for trachoma—that is, the occurrence of many cases of early follicular change in the conjunctivæ. The occurrence of such cases in so many intermediate and indeterminate forms is usually so great as to prevent a rigid classification of all cases of palpebral disease found. In contrast to the difficulty in diagnosis that arises most frequently in immigration work, where the controversy is whether a given case has advanced to a point of cicatrization where it is no longer infective, in school-inspection work, where the predominating type of trachoma is the early or beginning case, and where there exist so many variable types of follicular changes in the lids, the difficulty arises in differentiating the beginning trachoma from these cases of simple follicular change.

Recognizing the fact that it is just such cases as these that cause confusion and disagreements in diagnosis in public-health work of this character, and that the diagnosis of trachoma in its very early stages depends largely upon the personal equation of the examiner, it was decided not to attempt a definite diagnosis in all cases of palpebral diseases encountered, but that a diagnosis of trachoma should be made only in cases in which there could be no question as to the nature of the existing conditions. Such cases as were palpably folliculosis were excluded from consideration and the intermediate or border-line cases, in which there existed an element of doubt as to diagnosis, classified as suspicious, conceding to either diagnosis the existence of a liberal possibility. This, necessarily, has resulted in a rather large group under the latter heading, yet these cases can be handled along lines that will eliminate all but a remote danger should they be true trachoma, and, at the same time, obviate the possibility of injustice to the individual should they be follicular conjunctivitis.

Other palpebral conditions found were a number of cases of acute conjunctivitis or “pink eye,” blepharitis, styte, and numerous cases of chronic conjunctivitis or so-called “granulated lids.”

In the majority of positive cases the patients denied having eye disease, and as many cases of trachoma have their onset by gradual lymphoid proliferation instead of with the very acute symptoms so common to European cases, these statements were very probably based upon an ignorance of the existing condition. Again, the majority of individuals found infected with this type of trachoma were at an age when they could be expected to pay but little attention to the slight subjective symptoms accompanying such an onset. The great majority of positive cases were of the early so-called follicular type, yet very definite of diagnosis, presenting an abundance of

granulations on both lower and upper lids, and involving both the tarsal cartilages and retro-tarsal folds, and were classified as trachoma only when there existed the accompanying evidences of active inflammation. In no case was the diagnosis of trachoma based merely upon the existence of a few lymphoid follicles distributed along the tarsal margin or upon only the lower lids.

The majority of cases were in the stage of active and progressive lymphoid hypertrophy, but a few had advanced to the stage of retrogression, the follicles having been, or beginning to be, extruded, and beginning cicatrization was evident. As would be expected in a group of cases of this character, well-advanced cicatrization was rarely observed, only two or three cases at this stage being seen, while only two cases were found that presented corneal involvement or other serious complications. One of these showed an advanced pannus of the right eye, and was at the time of examination absent from school on account of the attendant visual incapacity.

In this survey, ptosis, or narrowing of the palpebral fissure, was a frequent first indication of an existing trachoma, especially in those cases showing thickening of the lids or beginning tendency toward chronicity. A slight photophobia was noticed in a number of cases; this, however, not being dependent upon corneal involvement, but rather the result of the onset of the acute condition. Bulbar conjunctival congestion was frequently noticed, and the majority of cases presented an active secretion, usually semipurulent in character—a point demonstrating the infectivity and danger from such cases.

Age Tabulations.

Age.	Number having trachoma.	Per cent of total cases.	Number of suspicious cases.	Per cent of total suspicious cases.
5	0	0	2	2.2
6	1	1.7	0	0
7	15	25.8	11	12.6
8	4	6.8	4	4.5
9	7	12	12	13.7
10	9	15.5	11	12.6
11	1	1.7	14	16
12	10	17.2	13	14.8
13	4	6.8	8	9.1
14	2	3.4	5	5.7
15	2	3.4	5	5.7
16	3	5.1	1	1.1
17	0	0	0	0
20	0	0	1	1.1
	58		87	

The tabulation of positive and suspicious cases indicates that the greatest infection was in children between the ages of 6 and 12, 81 per cent of the cases occurring between these years. Reduced further to percentages, it appears that the greatest number of cases found at any age was 15 cases at the age of 7, or 25.8 per cent. These figures are

substantiated by the fact that in several schools the greatest number of cases were found in the primary rooms, in which were children ranging in age from 5 to 10 years. This is readily explained by the fact that children of these years are considerably more careless in their personal habits than children of greater age, and that the chances of disseminating the infection by means of pencils, books, tablets, etc., as well as by actual contact, is much greater among young children than among older pupils. Very few cases were found above the age of 12 years. Again, the greatest number of suspicious cases were found in children between the ages of 7 and 12, which fact can be explained in the same manner as the positive cases, even though about as many children above the age of 12 were examined as below that age.

#### University and State Hospital for Insane.

In connection with the examination of the State university and the State insane hospital it may be explained that these examinations were made rather because the individuals were available for examination than on the supposition that an alarming infection with trachoma would be found. In 240 examinations in the State university 1 case was found. This case, however, was of recent origin, and, as the patient resided in the home of a case in a public-school pupil, he very probably contracted the infection from this source.

The Alabama State Hospital for the Insane was entered with the expectation that it might serve as an index for the State. Had any number of cases been found this would undoubtedly have been a valuable point in demonstrating the location of established foci of infection within the State, provided it were possible to exclude cases originating within the institution.

However, upon examination of 900 inmates and employees but 6 cases were found—5 in patients and 1 in a nurse. Examination of the entire hospital personnel of about 1,500 patients would probably not have produced additional cases, as all cases of eye trouble were asked for, producing, in addition to various nontrachomatous diseases of the eye, 5 of the 6 mentioned cases, after which the 900 patients were examined, with the finding of 1 additional case, but no suspicious cases. Four of the cases were undoubtedly of a great many years' standing and could not possibly have been contracted within the institution. All 4 showed completely cicatrized lids with severe and extensive corneal complications, while 1 of the patients reported that her husband was blind from the same cause. The nurse showed severe pannus in the right eye and completely cicatrized lids also, and gave a history of having had trachoma for about five years and prior to entering the institution. The sixth case was of the early type, and it can be safely said that the infection had its onset during the last year or two within the hospital. The 5 markedly chronic cases would

indicate trachomatous foci in the following counties in Alabama: Shelby, Marion, Etowah, Jackson, and Lamar.

#### Origin and Spread.

The examination of school children with the resultant finding of a majority of very early cases of trachoma could not be expected in itself to throw definite light on the length of time the infection had been present in this locality. An examination of the same number of adults, if the disease were found, would enable us to determine this point, at least approximately. Still a point of value in determining the probable duration is that but a very few of the total number of cases found, either active or recovered, were encountered among the pupils ranging in age from 16 to 20 years. It might reasonably be supposed that if the infection has been present in the community for a number of years there would have been found a relatively larger number of active cases as well as a number of late complications, and cicatrized lids among pupils of these ages. Again, the physicians of the city stated that they had seen no trachoma among adults, and prior to two years ago no trachoma at any age. Taking into consideration all facts determined by this survey, and particularly that three-fourths of the cases were found as early cases among children of the primary departments, it would appear that the disease is of comparatively recent introduction.

Just where the infection originally came from it is of course impossible to determine. Tuscaloosa has at the present time no foreign-born population, so that possibility of introduction may be eliminated. That trachoma to a slight degree, at least, has existed for a number of years within the State of Alabama, and might have been introduced from such indigenous foci appears probable, as is indicated by the finding of five well-defined cases of a number of years' standing in the Alabama State Hospital for the Insane. These patients were all from counties situated in the northern part of the State. Possibly considerable trachoma would be found in these localities if a careful survey were made, as they are situated in a region both geographically and economically somewhat like the mountainous counties of eastern Kentucky.

Having been introduced, unobserved, the usual conditions conducive to spread were necessarily operative. The schools, as usual, offered ideal conditions for the dissemination of the infection. However, the schools are not to be blamed altogether, as finding in a number of instances two or more children of the same family infected indicates that the disease has also been spread through unhygienic conditions within the homes. Probably as many cases have originated at home as within the schools, and this point would indicate

that eradication depends upon the introduction of preventive measures within the home as well as within the school.

A review of the method of the spread of trachoma is merely, in general, the often repeated statement that the disease is transmitted through intimate and unhygienic association with infected individuals. The common use of such articles as towels, handkerchiefs, washbasins, books, pencils, toys, etc., are everyday means of communicating the disease from the infected to the noninfected individual. When the diseased eyes are actually secreting a purulent discharge, the ease with which infection may be communicated can very readily be appreciated. At home the common use of articles of everyday necessity, bathing utensils, towels, wash cloths, and contaminated bedclothes, pillow slips, sheets, etc., is usually mentioned as the means of spreading the disease among successive members of the family. At school, books, pencils, etc., and actual contact of the infected with noninfected pupils are the means of transmitting the etiological factor. It is universally conceded that trachoma is an infectious disease, and that the infectious agent exists and is transmitted in the secretions and discharges from the diseased eyes. With pain or burning present in a diseased eye and one that is continually discharging, it is readily understood that the child will rub the eyes with hands or handkerchief, thereby keeping up a continuous stream of infectious secretion from the eyes to everything touched, and in this manner conveying the disease to the uninfected individual. The necessary contamination of bed linen and articles of toilet necessity under such conditions is obvious. Flies have been mentioned as concerned in the spread of trachoma. However, in the present instance, this is but a remote possibility. It can safely be said that the cause lies almost exclusively in the intimate association mentioned above, and in direct transmission of the infection from person to person.

#### Prevention.

Aside from the necessity of eradicating the existing disease by appropriate treatment, a most important necessity at the present time is the prevention of future cases. Without adequate attention to this point the situation will resolve itself into treatment of a constantly increasing number of cases of trachoma. The first step directed toward prophylaxis of infectious eye diseases is of course segregation of the affected individuals. This is to be accomplished by exclusion from school of all definite cases of trachoma found during the secreting or dangerous stage. This will minimize to a great extent the danger of spread through contact of infected with



uninfected pupils. Yet it does not take into consideration the protection of the community at large or the other members of the household where the excluded cases live. This is to be gained only through thorough instruction of the community, concerning the manner in which the disease is transmitted. Complete publicity should be given the situation, for, notwithstanding the inevitable opposition of certain individuals involved, publicity and popular instruction concerning the disease offer the best means of protecting the community.

By this is meant particularly popular instruction concerning the manner by which the disease is conveyed from person to person, how it may be prevented, and the difficulty of affecting a cure once it is contracted. School children and adults alike should be instructed in the rules of bodily cleanliness, particularly of the hands and eyes, and the use of individual toilet utensils and accessories, clean bed linen, etc., should be insisted upon. It should be taught that the danger lies in the discharge and secretion from the diseased eyes, and that anything that conveys this secretion is dangerous. The teachers should be carefully instructed, particularly in regard to the points of school hygiene involved in this disease, so that they may, at all times, intelligently exercise supervision over their pupils. Teachers should also be taught how to detect early cases of inflamed and discharging eyes, and should be required to report such cases to the school physician as soon as noted.

Such practices as collecting pens, ink, etc., into one receptacle and distributing them again when they are to be used is illustrative of how the infection may be spread. This was noted in one of the schools examined, and, with other practices of like character, should be dispensed with. Supervision of the trachomatous pupil after exclusion from school is necessary in order that the immediate family and community at large may be protected. Treatment should be facilitated as much as possible, and to do this it devolves upon the community as a duty to furnish adequate treatment if the individual is not able to provide it for himself. Personal instruction in how to prevent the transmission of the disease to others should be given and further spread limited by instruction of the uninfected individual concerning the proper hygienic procedure to follow in order to avoid the disease. More good can probably be accomplished by teaching a community to protect itself by habits of strict personal hygiene and prophylaxis than by depending entirely upon the probability that the infected individual will himself avoid spreading the disease by carelessness and otherwise.

### Recommendations.

The following recommendations were suggested to be applied in this instance if further spread of the disease is to be limited:

Exclusion from the public schools of all known positive cases of trachoma.

Treatment of the suspicious cases. That young school children are very prone to lymphoid hypertrophy, especially of the conjunctivæ, is well known and to exclude this class of children from school would be manifestly an injustice, as the majority will very probably prove not to be trachomatous. The possibility of spread from any of the suspicious cases that may prove to be trachoma will be reduced to a minimum by allowing these children to remain in school provided they accept active and consistent treatment at the hands of the school authorities. To meet this necessity, medical attention should be furnished by the school board free of cost. This would necessitate the employment of a medical officer and nurse to give attention to all cases, and at the same time to supervise the carrying out of strict sanitary precautions in so far as these children are concerned. Free medical attention might also be given any of the excluded patients who desire it in order that adequate treatment might be received by those unable to provide it for themselves.

The return of any excluded case to school should be permitted only upon a certificate from the health officer and school physician, this certificate to be rendered only when the case is entirely recovered or when it can be pronounced no longer infective.

The entire enrollment of the public school should be examined periodically, and if new cases of eye disease are found they should be placed in either of the before-mentioned classes and treated accordingly.

Treatment should be based upon the assumption that trachoma is essentially a surgical disease, and in this instance, on account of the large number of early cases found, surgical treatment, together with such additional aftertreatment as is indicated, offers the most favorable means for a rapid cure in the majority of cases.

A publicity campaign should be instituted to educate the people in the modes of spread, the dangers from this disease and the method of prophylaxis by which it may be avoided.